【DESCRIPTION】

【Invention Title】

FIBER REINFORCED CEMENT BOARD AND FOAM PLASTIC INSULATED STAY IN PLACE FORMS SYSTEMS WITH PERFORATED METAL STUD FOR CENCRETE REINFORCED STRUCTURE

【Technical Field】

The present invention relates to a fixed-type form panel system comprising form panels constituting a foundation wall, a bottom between floors, and a roof of a building or a concrete structure, compression cement boards using vertical reinforcement-purpose metal plate studs, and steel studs.

【Background Art】

FIG. 1 is a perspective view illustrating the structure of a concrete frame constructed by means of a conventional form system using plywood forms and reinforcing bars. As illustrated in FIG. 1, reinforcing bars 1 and 2 are disposed vertically and horizontally on the basis of the thickness and height of a wall body designed to construct a foundation wall or a wall, reinforcing bars 3, which are bent in multi-cornered shapes or circular shapes, are disposed around the reinforcing bars 1 and 2, and the reinforcing bars 3 are connected to the reinforcing bars 1 and 2 by means of wires so as to construct the conventional concrete structure for building or civil-engineering works. Also, forms 4 and 5, which are made of wood or steel, are disposed while being opposite to each other along the arranged reinforcing bar frame, and connecting pins are fixedly inserted through connection holes 6 formed at the forms 4 and 4 to connect the forms 4 and 5 to each other. In this way, the frame of the forms is prepared. Concrete 7 is

injected into the reinforcing bar and form frames. The concrete is cured and dried for approximately 3 to 7 days. After the concrete 7 is solidified, the forms 4 and 5 are disassembled. Finally, supporting pins protruded from the surface of the concrete or protruded concrete parts on the surface of the concrete are appropriately eliminated. The above-described conventional form system has been widely used to construct the retaining wall-type reinforced concrete frame.

However, the conventional retaining wall-type reinforced concrete frame system requires a large number of wood or steel forms. In addition, a large amount of subsidiary materials, including supporting members, are required to connect the forms to each other and construct the frame, which increases labor and time. Furthermore, a large number of reinforcing bars are vertically disposed, and other reinforcing bars are bent and curved such that the bent and curved reinforcing bars intersect with the vertically disposed reinforcing bars. The reinforcing bars, which intersect each other, are connected to each other by means of wires. In this way, the frame is prepared. This requires a large amount of materials. After the concrete is dried, the forms are disassembled, and then removed, which requires labor and time. Also, it is required that additional heat insulating materials, such as foamed polystyrene, rock wool, and glass fiber, be attached to the surface of the concrete using cement mortar for the purpose of heat insulation when the structure, such as a building, is constructed. This work is very troublesome.

A method of using foamed polystyrene hollow blocks as the forms has been proposed in order to solve the above-mentioned problem of the conventional retaining wall-type reinforced concrete frame system.

FIG. 2 is a perspective view illustrating the structure of a foamed polystyrene hollow block manufactured by means of a conventional foam forming machine. As illustrated in FIG. 2, the foamed polystyrene hollow block manufactured by means of the conventional foam forming machine comprises: foamed polystyrene block parts 8 having protrusions formed at the upper ends

thereof; and block supporting pins 11 disposed in the foamed polystyrene block parts 8 or between the foamed polystyrene block parts 8. The block supporting pins 11 are made of metal materials.

The foamed polystyrene hollow block is manufactured as follows: the metal block supporting pins 11 are disposed in a mold, and foamed polystyrene, which is light in weight and has excellent heat insulating effects, is injected into the mold by means of the foam forming machine. After that, the foamed polystyrene hollow block is separated from the mold, cooled, and then dried.

Since the foamed polystyrene hollow block is manufactured using the mold, however, the shape and the structure of the foamed polystyrene hollow block are limited such that the foamed polystyrene hollow block is easily separated from the mold. Also, the size of the mold is increased as the size of the foamed polystyrene hollow block is increased, which is not economical. Furthermore, the foam forming machine, which is very expensive, is required, and it is required to manufacture a large number of molds corresponding to different sizes and shapes of the foamed polystyrene hollow block. As a result, the costs for manufacturing the foamed polystyrene hollow block are considerably increased. Also, foam forming, cooling, and drying processes take much time, which considerably lowers the productivity.

The metal supporting pins of the molded hollow block is not connected to the metal supporting pins of another molded hollow block. Consequently, reinforcing bars are disposed vertically and horizontally in the hollow blocks, and are then connected to each other by means of wires. The reinforcing bar arrangement and reinforcing bar connection take much labor and time. When concrete is injected into the foamed polystyrene hollow blocks, the foamed polystyrene hollow blocks may collapse or concrete may leak from the connections between the foamed polystyrene hollow blocks, due to the weight and pressure caused by the injected concrete. For this reason, it is required that a bonding agent be applied to the connections between the foamed polystyrene

hollow blocks, which are arranged not only above and below but also right and left. This is very troublesome work.

After the concrete filled in the foamed polystyrene hollow blocks is solidified, the foamed polystyrene material parts are exposed from the outer surface of the structure. The foamed polystyrene material parts have poor thermal resistance, and therefore, they may be easily burnt when a fire breaks out. For this reason, it is required that cement be applied to the entire surfaces of the structure before various interior and exterior decoration materials, such as paint, wall paper or timber, tile, marble, etc., are attached to the insides and outsides of the hollow blocks. However, the cement is not easily attached to the foamed polystyrene material parts. Consequently, it is further required that additional glass fiber nets or wire nets be attached to the foamed polystyrene material parts, and then the cement, for example, mortar, be thickly applied to the foamed polystyrene material parts with the glass fiber nets or wire nets attached thereto. Also, it is required that square materials, which are made of wood or metal, be attached to the cement applied to the foamed polystyrene material parts, and then interior and exterior decoration works be additionally performed. This is very troublesome work.

FIG. 45 is a view illustrating a conventional retaining wall-type reinforced concrete frame system used to construct a bottom between floors. In the conventional retaining wall-type reinforced concrete frame system used to construct a bottom between floors as illustrated in FIG. 45, wood plate or iron plate forms 4 are horizontally disposed between a wall 13 and another wall 14 such that the wood plate or iron plate forms 4 are used as supporting plates 12 in which concrete is filled, and reinforcing bars 1, which are stacked at the upper part of the retaining wall-type reinforced concrete frame system, side forms 5 that support the concrete, and the supporting plates 12 are supported by means of a plurality of steel pipes 15 disposed between the supporting plates 12 and the bottom of the downstairs.

In the conventional system to construct the bottom between floors, the steel pipes 15 are vertically mounted on the bottom of the downstairs such that the forms serving as the supporting plates 12, which are made of wood, for example, plywood, are supported by means of the steel pipes 15 in order to reduce load applied to the supporting plates 12. As a result, it takes time and costs to vertically dispose the steel pipes. When any one of the steel pipes 15 supporting the supporting plates 12 collapses, the entire supporting plates are fallen down due to the weight and pressure of the reinforcing bars and the concrete put on the upper parts of the supporting plates 12, which leads to the loss of lives and properties.

Another type of form system has been proposed wherein cement boards are disposed while being opposite to each other, and the opposite cement boards are connected to each other by means of connecting wires. In this form system, however, it is required that additional supporting members be disposed at the outsides of the opposite cement boards or additional distance-maintaining units be disposed between the cement boards, at a preliminary step of injecting concrete, so as to maintain the constant distance between the cement boards. This is very troublesome work.

Another connection system has been proposed wherein pipes are fixed between form panels for convenience in piping works. In this connection system, however, all the pipes are mounted before concrete is injected. Also, the pipes are integrally connected to the concrete, and therefore, the pipes cannot be replaced after all the pipes are mounted.

【Disclosure】

【Technical Problem】

Therefore, the present invention has been made in view of the above problems, and it is an object of the present invention to provide a fixed-type form panel system comprising compression cement boards, foamed plastic panels, which

serve as not only heat insulating members but also interior and exterior decoration members while being easily mounted, and steel studs, wherein each of the compression cement boards use metal plate studs as vertical or horizontal reinforcing members instead of vertically or horizontally disposed reinforcing bars, or the compression cement boards are reinforced with cement board reinforcing members.

It is another object of the present invention to reduce reinforcing bars, plywood, and materials for metal plate forms, which are mainly used to construct a wall of a building or a concrete structure for civil-engineering works in a retaining wall-type reinforced concrete frame system, to eliminate a reinforcing bar bending process and a connecting process of connecting the reinforcing bars to each other by means of wires, to simplify a form frame preparing process, to reduce time, labor, and costs for assembling and disassembling the form frame, to eliminate a process of grinding the surfaces of supporting members protruded from the surface of the concrete or the surface of protruded parts of the concrete after disassembling the form, to simplify a process of interior and exterior decoration process using cement and mortar, and to provide a form panel system with inflammability and heat insulation property.

It is another object of the present invention to manufacture various-shaped form panels using a heating wire-type forming machine, instead of a foam forming machine and a mold, whereby productivity is improved and the form panels are provided with formative pleasing appearance as compared to a mold-type hollow block manufactured by injecting bead-shaped foamed polystyrene materials into the foam forming machine and the mold, and injecting high-temperature, high-pressure steam such that the foamed polystyrene materials are heated with the steam so as to form a panel.

It is another object of the present invention to reduce time and costs for constructing bottoms between floors and girders of the building by not using form-shaped supporting plates and supporting posts, to prevent reinforcing bars from

drooping when the reinforcing bars are used, and to maintain constant heights and distances when the bottoms between floors and the girders of the building are constructed, whereby a stable structure is obtained.

It is another object of the present invention to previously manufacture a foundation wall and an outer wall of the structure at a manufacturing factory, thereby reducing time and costs as compared to the case where the foundation wall is constructed using reinforcing bars and forms at a construction site, and then the outer wall is constructed.

It is another object of the present invention to eliminate a process of attaching additional heat insulating materials through the use of foamed plastic panels serving as heat insulating materials, and to provide excellent heat insulation effect by attaching the foamed plastic panels to both sides thereof.

It is another object of the present invention to attach fiber-shaped mesh-reinforced compression cement boards with excellent strength, adhesive property, water resistance, and inflammability to one side of the panel such that various decoration finishing materials, such as tile, timber, marble, wall paper, etc., are easily and conveniently applicable thereto.

It is another object of the present invention to provide increase the strength of the form panel system using compression cement boards, whereby the amount of concrete injected is decreased.

It is another object of the present invention to hydrate concrete for a long time while the form is not disassembled after the concrete is injected, whereby the strength of the concrete is increased than that of the conventional reinforced concrete structure.

It is another object of the present invention to prescribe the distance between the compression cement boards by means of metal plate studs disposed between the compression cement boards, and to replace vertically or horizontally disposed reinforcing bars with the metal plate studs.

It is another object of the present invention to prevent concrete from

leaking and facilitate the movement of the concrete through the use of one-plane connecting members.

It is another object of the present invention to form openings whose widths are gradually decreased toward the lower parts thereof at the metal plate studs such that reinforcing bars can be securely fitted in the openings by the wedge effect.

It is another object of the present invention to freely move concrete through openings formed at the metal plate studs and two-plane connecting members, whereby the durability of the concrete is increased and maintained.

It is yet another object of the present invention to attach cement board reinforcing members to the compression cement boards while the thickness of the cement board reinforcing members and the distance between the cement board reinforcing members are freely selected, whereby the compression cement boards are reinforced, and thus, the durability of concrete is increased.

【Technical Solution】

In accordance with an aspect of the present invention, the above and other objects can be accomplished by the provision of a form panel system comprising: compression cement boards disposed opposite to each other while being spaced a predetermined distance from each other, the compression cement boards being reinforced with fiber materials; reinforcing boards obtained by forming the compression cement boards in predetermined shapes, or foamed plastic heat insulating panels; and metal plate studs disposed between the compression cement boards, the metal plate studs being composed of metal plates having predetermined thicknesses and distances therebetween, which are selected depending on the durability of concrete, each of the metal plate studs having at least one opening formed therein, each of the metal plate studs being provided at both opposite side ends thereof with bent parts, wherein the metal plate stud is fixed to the respective compression cement boards by means of fixing pieces, and concrete is injected and

cured into the space between the compression cement boards, to which the metal plate studs are fixed and the foamed plastic heat insulating panels are attached, whereby the fiber-reinforced compression cement boards, the foamed plastic heat insulating panels, the metal plate studs having the openings are vertically or horizontally arranged without limits.

【Advantageous Effects】

With an integrated fixed-type form panel system comprising fiber-reinforced compression cement boards, foamed plastic heat insulating panels, metal plate studs having openings formed therein according to the present invention, reinforcing bars, plywood, and materials for metal plate forms, which are mainly used to construct a wall of a building or a concrete structure for civil-engineering works in a retaining wall-type reinforced concrete frame system are reduced, a reinforcing bar bending process and a connecting process of connecting the reinforcing bars to each other by means of wires are eliminated, and a form frame preparing process is simplified. Also, time, labor, and costs for assembling and disassembling the form frame are reduced, and a process of interior and exterior decoration process is simply performed without performing a process of grinding the surfaces of supporting members protruded from the surface of the concrete or the surface of protruded parts of the concrete after disassembling the form. Specifically, the compression cement boards used for the panel system according to the present invention are compressed by means of rollers with the result that the surfaces of the compression cement boards are smooth. Consequently, an interior and exterior decoration process is simplified when the compression cement boards according to the present invention are used.

In a preferred embodiment, the compression cement boards are used for a form in which concrete is injected and cured, and the form including compression cement boards are not disassembled after the injected concrete has been solidified.

As a result, the strength of the concrete is increased by means of the compression cement boards, and therefore, the amount of concrete to be injected is reduced.

With a conventional form, concrete is cured for approximately 3 to 7 days after the concrete is injected into the form, and then the form is disassembled. When the form is disassembled, moisture is rapidly evaporated from the concrete with the result that the effect of the strength increase of the concrete is lowered. With a fixed-type form system according to the present invention, on the other hand, the form is not disassembled after concrete is injected into the form. As a result, the concrete is cured through a long hydration reaction in which moisture contained in the concrete is slowly evaporated until approximately 28 days elapses after the concerted has been injected into the form. Consequently, the strength of a concrete structure using the form panel system according to the present invention is 30 % higher than that of a conventional reinforced concrete structure obtained through a disassembling and removing process of the wood or steel plate forms.

According to the present invention, the distance between the compression cement boards is prescribed by means of the metal plate studs disposed between the compression cement boards. Simultaneously, the vertically or horizontally disposed reinforcing bars are replaced with the metal plate studs. Consequently, the concrete structure with a correct thickness is formed without using additional structural members, and a reinforcing bar arranging process is eliminated.

The one-plane connection members prevent concrete from leaking from the connections between the compression cement boards or the foamed plastic panels. Also, the panels are connected to each other while the spaces between the panels are not obstructed by means of the one-plane connection members. As a result, concrete injected into one side of the form panel system moves along the spaces between the panels such that the concrete is wholly filled in the form panel system. Consequently, the concrete is easily and conveniently injected and distributed. The same effect is accomplished by means of the opening formed at the two-plane connecting members. Specifically, the opposite panels are

connected to each other by means of the two-plane connecting members, and simultaneously, the panels arranged on the same plane are connected to each other by means of the two-plane connecting members. The spaces between the panels communicate with each other through the openings of the two-plane connecting members.

The metal plate studs used in the present invention are provided with the openings. As a result, horizontal reinforcing members, such as reinforcing bars or steel pipes, can be horizontally inserted through the openings of the metal plate studs. Also, the openings are formed such that their widths are gradually decreased toward the lower parts thereof, i.e., in the direction in which the gravity is applied. Consequently, when the reinforcing bars inserted through the openings of the metal plate studs, the reinforcing bars go down into the narrow parts of the openings due to the weights of the reinforcing bars, and thus the reinforcing bars are fitted in the openings by the wedge effect. When the reinforcing bars are slightly pushed from above, the reinforcing bars are securely fitted in the openings of the metal plate studs. Consequently, the reinforcing bars, which serve as horizontal reinforcing members when concrete is injected, are not displaced from their original positions without connecting the reinforcing bars by means of wires.

The openings of the metal plate studs are formed such that the size of each of the openings of the metal plate studs is larger than the sectional area of each of the horizontal reinforcing members. Consequently, the concrete freely moves in the spaces between the panels through the empty parts of the openings of the metal plate studs after the horizontal reinforcing members are inserted in the openings of the metal plate studs.

The compression cement boards are reinforced with the linear cement board reinforcing members attached horizontally or vertically to the insides of the compression cement boards. Consequently, the compression cement boards sufficiently bear the inner pressure of the concrete by virtue of the linear cement

board reinforcing members.

When the metal plate studs are connected to each other in large numbers, a wall having different widths may be formed. Consequently, a foundation work and a wall forming work can be simultaneously performed at a time by the provision of a double-layered structure comprising a foundation wall and an upper wall.

According to the present invention, each of the metal plate studs may be formed with a multiple of the height of each of the compression cement boards. Consequently, it is possible that the compression cement boards are connected to each other in a double-layered structure.

Also, the metal plate studs and foamed plastic studs may be formed in asymmetric shapes or irregular shapes such that the present invention is applicable to a retaining wall structure or a bank structure.

Pipes are inserted through the openings formed at the metal plate studs, the I-type foamed plastic connecting members, and the two-plane connection members. Consequently, an electric work, a telephone line work, and a communication line work are performed simultaneously when the wall is formed.

With the panel system according to the present invention, various-shaped opening parts between the compression cement boards may be covered by means of a cover. Consequently, a door frame and a window frame may be easily formed.

Also, the form panel according to the present invention is manufactured, without limits to its shape and size, using a computerized or automatically controllable heating wire-type forming machine instead of the foam forming machine or the mold. Consequently, mass production of the form panel is possible, and therefore, productivity is improved together with improved formatively pleasing appearance.

According to the present invention, form-shaped supporting plates and supporting posts are not used when bottoms between floors and girders of the

building are constructed. Consequently, time and costs are reduced. Furthermore, the reinforcing bars are prevented from drooping when they are used, and constant heights and distances are maintained, whereby a stable structure is obtained.

According to the present invention, a foundation wall and a wall of the structure may be previously manufactured at a manufacturing factory. Consequently, time, labor and costs are reduced as compared to the system in which the foundation wall is constructed using reinforcing bars and forms at a construction site, and then the outer wall is constructed.

The form panels previously disposed at both sides of the form panel system according to the present invention serve as the foamed plastic heat insulating materials. Consequently, a process of applying mortar to the concrete and attaching heat insulating materials is eliminated, which reduces labor and costs. Since the heat insulating materials are disposed at both sides of the form panel system, the heat insulation property is increased, and coefficient of overall heat transmission is decreased. Consequently, the energy saving effect of the present invention is excellent.

Also, the fiber-shaped mesh-reinforced compression cement boards with excellent strength, adhesive property, water resistance, and inflammability are attached to both sides of the panel. Consequently, various decoration finishing materials, such as tile, timber, marble, wall paper, etc., are easily and conveniently applicable to the form panel system according to the present invention.

【Description of Drawings】

The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view illustrating the structure of a concrete frame constructed by means of a conventional form system using plywood forms and

reinforcing bars;

FIG. 2 is a perspective view illustrating the structure of a foamed polystyrene hollow block manufactured by means of a conventional foam forming machine;

FIG. 3 is a perspective view illustrating a compression cement board used for a form panel system according to the present invention;

FIGS. 4 to 6 are perspective views respectively illustrating cement board reinforcing members and a cement board reinforcing metal member, each of which will be fixed to the compression cement board;

FIGS. 7 to 9 are perspective views respectively illustrating compression cement board assemblies, each of which comprises a compression cement board and cement board reinforcing members or cement board reinforcing metal members fixed to the compression cement board;

FIG. 10 is a perspective view illustrating a compression cement board assembly comprising a compression cement board and cement reinforcing members fixed to the compression cement board in the longitudinal direction of the compression cement board;

FIG. 11 is a perspective view illustrating a cement board connecting member, which is used to connect compression cement board assemblies of the form panel system according to the present invention to each other;

FIGS. 12 to 14 are perspective views respectively illustrating compression cement board assemblies of the form panel system according to the present invention, which are arranged in a straight shape, a "ㄱ" shape, and a "T" shape;

FIG. 15 is a perspective view partially illustrating a leak-preventing structure of the compression cement boards with the cement board reinforcing members fixed thereto in the longitudinal direction of the compression cement boards;

FIG. 16 is a perspective view illustrating examples of foamed plastic

panels of the form panel system according to the present invention;

FIG. 17 is a plan view illustrating another example of a foamed plastic panel of the form panel system according to the present invention;

FIG. 18 is a perspective view illustrating a multiple electric heating wire-type forming machine used to process the foamed plastic panel;

FIG. 19 is a perspective view illustrating that the foamed plastic panel is fixed to the compression cement board assembly of the form panel system according to the present invention;

FIGS. 20 and 21 are views respectively illustrating a bottom fixing member and a stud connecting metal plate member used for the form panel system according to the present invention;

FIGS. 22 and 23 are perspective view respectively illustrating that reinforcing bars are inserted through a metal plate stud used for the form panel system according to the present invention;

FIGS. 24 to 29 are perspective view respectively illustrating "["-shaped metal plate studs used for the form panel system according to the present invention;

FIGS. 30 and 31 are views respectively illustrating examples of metal plate studs of the form panel system according to the present invention, each of the metal plate stud having openings whose widths are gradually decreased toward the lower parts thereof;

FIGS. 32 and 33 are perspective view respectively illustrating foamed plastic studs used for the form panel system according to the present invention;

FIG. 34 is a perspective view illustrating a form panel system according to a preferred embodiment of the present invention;

FIG. 35 is a perspective view illustrating a one-plane connecting member used to connect compression cement boards of the form panel system according to the present invention to each other on the same plane;

FIG. 36 is a plan view illustrating compression cement boards connected

to each other by means of the one-plane connecting member;

FIG. 37 is a perspective view illustrating a one-plane connecting metal plate member;

FIG. 38 is a plan view illustrating compression cement boards connected to each other by means of the one-plane connecting metal plate member;

FIG. 39 is a plan view schematically illustrating that compression cement boards, to which foamed plastic panels are fixed, are connected to each other by means of a two-plane connecting metal plate member;

FIG. 40 is a longitudinal sectional view illustrating a form panel system according to another preferred embodiment of the present invention;

FIG. 41 is a longitudinal sectional view illustrating a form panel system according to another preferred embodiment of the present invention;

FIG. 42 is a longitudinal sectional view illustrating a form panel system according to another preferred embodiment of the present invention;

FIG. 43 is a partial perspective view illustrating a form panel system according to another preferred embodiment of the present invention;

FIG. 44 is a perspective view illustrating a form panel system according to yet another preferred embodiment of the present invention;

FIG. 45 is a view illustrating a conventional retaining wall-type reinforced concrete frame system used to construct a bottom between floors;

FIG. 46 is a perspective view illustrating a supporting beam used for a form deck panel system according to the present invention;

FIG. 47 is a perspective view illustrating a foamed plastic bottom plate panel and an upper bottom plate panel used for the form deck panel system using compression cement boards according to the present invention;

FIG. 48 is a perspective view illustrating a double-layered form deck panel using compression cement boards according to the present invention; and

FIG. 49 is a partial sectional view illustrating a building, to which the form panel system and the form deck panel system according to the present

invention are applied.

【Best Mode】

Now, a fixed type form panel system using compression cement boards and metal plate studs according to a preferred embodiment of the present invention will be described in detail with reference to the accompanying drawings.

FIG. 3 is a perspective view illustrating a compression cement board used for the form panel system according to the present invention. As illustrated in FIG. 3, a compression cement board 20 of the form panel system according to the present invention is made of magnesia cement having magnesium oxide and magnesium chloride as main components thereof or cement having silicate (silica) and kaolin, which are compounded. The magnesia cement or the compounded cement is prepared in a clay state. Glass fiber or synthetic resin is mixed in the composition, or coarse glass fiber nets or synthetic resin net are attached to the both sides of the composition in the shape of a mesh, and then the composition is compressed by means of high-pressure rollers. In this way, the compression cement board is prepared. Generally, the compression cement board has a compression strength of not less than 180 kg/cm^2. Consequently, the compression cement board 20 includes a lattice-type glass fiber net 23 having not less than 40 meshes, which is formed in the compression cement board 20 or either side of the compression cement board 20.

For the compression cement board according to the present invention, however, Portland-based cement may be used instead of the silicate or magnesia cement. Also, roller-compressed high-strength cement board, which is composed of a noninflammable cement material, reinforced with fiber having a compression strength of not less than 180 kg/cm^2, and compressed by means of high-pressure rollers, may be used. Such a roller-compressed high-strength cement board is fallen into the scope of the present invention.

As the reinforcing material used to reinforce the compression cement

board, various reinforcing material, such as reinforce plastic or rock wool, which prevents the concrete from being broken may be used in addition to the glass fiber net.

FIGS. 4 to 6 are perspective views respectively illustrating cement board reinforcing members and a cement board reinforcing metal member, each of which will be fixed to the compression cement board. As illustrated in FIGS. 4 to 6, cement board reinforcing members 30 and 31 are formed by shaping the compression cement board such that the compression cement board has a reverse-trapezoid section and a rectangular section, respectively. A cement board reinforcing metal member 33, which is a modified example of the cement board reinforcing member, is formed by folding a metal plate having excellent strength, such as galvanized steel plate, twice. In the illustrated case, the cement board reinforcing metal member 33 has a "C"-shaped section.

FIGS. 7 to 9 are perspective views respectively illustrating compression cement board assemblies, each of which comprises a compression cement board and cement board reinforcing members or cement board reinforcing metal members fixed to the compression cement board. As illustrated in FIGS. 7 to 9, the cement board reinforcing members 30 and 31 and the C-shaped cement board reinforcing metal member 33 are fixed to one side of the compress cement board 20 in the lateral direction of the compress cement board 20, respectively. In this way, the compression cement board assemblies 35, 36, and 37 are prepared. The fixing of the cement board reinforcing members and the C-shaped cement board reinforcing metal member to one side of the compress cement board is accomplished through the use of a bonding agent or bolts. Through the spaces between the cement board reinforcing members 30 and 31 or through the inner spaces of the C-shaped cement board reinforcing metal members 33 are mounted metal plate studs. Consequently, the mounting positions of the metal plate studs are decided by the cement board reinforcing members.

FIG. 10 is a perspective view illustrating a compression cement board

assembly comprising a compression cement board and cement reinforcing members fixed to the compression cement board in the longitudinal direction of the compression cement board. As illustrated in FIG. 10, cement reinforcing members 34 are fixed to the compression cement board 20 in the longitudinal direction of the compression cement board 20. This construction is suitable when the height of the wall is low, such as a one-story building. In this case, a small number of relatively long reinforcing members are disposed in the longitudinal direction of the compression cement board rather than a large number of relatively short reinforcing members are vertically disposed, which is very economical. Also, this construction is very suitable when reinforcement is further required to lateral bending stress rather than longitudinal bending stress. Although not illustrated in the drawing, the metal plate studs are fixed to the compression cement board by means of fixing pieces through the surfaces of the reinforcing members. The cement board reinforcing members 34 are attached to the compression board using the same kind of inorganic bonding agent, such as liquid sodium silicate, high-waterproof potassium silicate, lithium silicate, or colloidal silica.

FIG. 11 is a perspective view illustrating a cement board connecting member, which is used to connect compression cement board assemblies of the form panel system according to the present invention to each other. As illustrated in FIG. 11, a cement board connecting member 39 is used to connect the compression cement board assemblies to each other. A metal plate, for example, a galvanized steel plate, is bent at a right angle, and bolt holes 40 are formed at the bent metal plate. In this way, the cement board connecting member 39 is prepared.

FIGS. 12 to 14 are perspective views respectively illustrating compression cement board assemblies of the form panel system according to the present invention, which are arranged in a straight shape, a "ㄱ" shape, and a "T" shape. As illustrated in FIGS. 12 to 14, a compression cement board assembly 35

is arranged in the straight shape, and compression cement board assemblies 42 and 43 are arranged in the "ㄱ" shape and the "T" shape, respectively, by connecting the compression cement board assemblies 35 to each other through the use of cement board connecting members 38. The arrangement of the compression cement board assemblies varies depending upon their use.

FIG. 15 is a perspective view partially illustrating a leak-preventing structure of the compression cement boards with the cement board reinforcing members fixed thereto in the longitudinal direction of the compression cement boards. As illustrated in FIG. 15, cement board reinforcing members 34a and 34b are fixed to the compression cement boards 20. When the compression cement boards 20 are connected to each other in the longitudinal direction of the compression cement boards 20, the cement board reinforcing member 34a corresponding to one of the compression cement boards extends longer in the longitudinal direction of the compression cement boards than the end of the corresponding compression cement board 20. On the other hand, the cement board reinforcing member 34b corresponding to the other the compression cement board is formed with a length shortened by the longitudinally extended length of the cement board reinforcing member 34a. As a result, the extended part of the cement board reinforcing member 34a partially covers connection between the compression cement boards 20. The uncovered connection between the compression cement boards 20 is covered by means of additional foamed polystyrene (EPS) pieces 32, which are attached to the compression cement boards 20 along the connection between the compression cement boards 20. The connection between the compression cement boards is accomplished by fixing metal plate studs (not shown) to the compression cement boards 20 with fixing pieces.

FIG. 16 is a perspective view illustrating examples of foamed plastic panels of the form panel system according to the present invention. As illustrated in FIG. 16, foamed plastic panels 50 and 55 have latching protrusions 52 having

reverse-trapezoid sections 52 formed at one side and both sides thereof, respectively. Between the latching protrusions 52 are formed supporting grooves 51. At the upper end of the panel is formed a connecting projection 53, and at the lower end of the panel is formed a connecting groove (not shown), in which the connecting projection 53 is engaged. When two panels are connected to each other in lateral direction thereof, the connecting projection 53 of one of the panels is engaged in the connecting groove of the other panel. Consequently, concrete is prevented from leaking from the connection between the panels. Each of the supporting grooves 51 is formed such that the width at the entrance thereof is less than that of the inner space thereof. Consequently, when latching protrusions of studs, which will be described below, are engaged in the supporting grooves in a slide fashion, the studs and the foamed plastic panels are not separated from each other in the longitudinal direction of the foamed plastic panel. The foamed plastic panel may be formed in a vertically bent shape.

FIG. 17 is a plan view illustrating another example of a foamed plastic panel of the form panel system according to the present invention. As illustrated in FIG. 17, the foamed plastic panel 56 may be formed with unlimited shapes through the use of a computerized multiple electric heating wire-type forming machine, which will be described below. For example, the foamed plastic panel 56 may have various shaped slits.

Specifically, the foamed plastic panel 56 may have a "ㄱ"-shaped slit 57a, a "T"-shaped slit 57b, "ㄱ"-shaped slit with a bent end 57c, and a "T"-shaped slit with a bent end 57d. At both ends of the foamed plastic panel 56 are formed supporting groves 57e, in which a one-plane connecting member, which will be described below, is engaged. The thickness at the both end of the foamed plastic panel 56 is less than that at the other part of the foamed plastic panel 56.

The compression cement boards having the foamed plastic panels with the above-described slits are connected to each other by means of metal plate studs having shapes corresponding to those of the slits, which will be described below.

FIG. 18 is a perspective view illustrating a multiple electric heating wire-type forming machine used to process the foamed plastic panel. As illustrated in FIG. 18, the multiple electric heating wire-type forming machine comprises a computer 60, a heating wire-type forming unit 62, and a power supply unit 61. The heating wire-type forming unit 62 comprises: a base 63 having guide rails 64 formed at both opposite sides thereof and a table 65 attached to the middle thereof for allowing a foamed plastic block to be placed thereon; a forming machine frame 66 linearly movable along the guide rails 64 of the base 63; heating wires 67 disposed inside the forming machine frame 66 such that the heating wires 67 can be vertically moved along the forming machine frame 66; and a control unit (not shown) to control the forming machine frame 66 and the heating wires 67.

When the foamed plastic block is placed on the table 65, the computer transmits a signal to the heating wire-type forming unit, and the control unit of the heating wire-type forming unit controls the linear movement of the forming machine frame and the vertical movement of the heating wires such that the foamed plastic block is cut or processed in various shapes, such as a straight shape, a "ㄱ" shape and a "T" shape. Especially, the reverse-trapezoid supporting grooves, which are impossible to form in a molding method due to the problem of the foamed plastic block being separated from the mold, may be easily processed in accordance with the present invention. In addition, the multiple electric heating wire-type forming machine may process foamed plastic studs, which will be described below.

The multiple electric heating wire-type forming machine processes foamed plastic blocks made of various materials, such as foamed polyurethane, foamed polypropylene, or foamed polyethylene, which have excellent resistance to impacts, heat, fire and water, and excellent sound absorption.

FIG. 19 is a perspective view illustrating that the foamed plastic panel is fixed to the compression cement board assembly of the form panel system according to the present invention. As illustrated in FIG. 19, the fixation of the

foamed plastic panel 55 to the compression cement board assembly 35 is accomplished by inserting the latching protrusions of the foamed plastic panel into the corresponding supporting grooves of the compression cement board assembly. Alternatively, the foamed plastic panel may be attached to the compression cement board assembly by means of a bonding agent.

FIGS. 20 and 21 are views respectively illustrating a bottom fixing member and a stud connecting metal plate member used for the form panel system according to the present invention. As illustrated in FIGS. 20 and 21, a bottom fixing member 70 is formed by bending a metal plate having excellent corrosion resistance and strength, such as a galvanized steel plate, and attaching triangular reinforcing plates at both opposite sides of the bent metal plate by means of welding. A stud connecting metal plate member 76 is formed by bending a metal plate. At the bottom fixing member and the stud connecting metal plate member 76 are formed bolt holes 74 and an opening 71, through which reinforcing bars are inserted. The width of the opening 71 is gradually decreased toward the lower part thereof. Consequently, when they are inserted through the opening, the reinforcing bars go down into the narrow part of the opening due to the weights of the reinforcing bars, and thus the reinforcing bars are securely fitted in the opening by the wedge effect of the opening.

FIGS. 22 and 23 are perspective view respectively illustrating that reinforcing bars are inserted through a metal plate stud used for the form panel system according to the present invention. As illustrated in FIG. 22, an I-type metal plate stud 85, through which the reinforcing bars are inserted, is composed of a metal plate having excellent corrosion resistance and strength, such as a galvanized steel plate. The openings 71 are formed at the metal plate stud 85. The metal plate stud 83 is bent at the right angle through cut lines at both opposite sides thereof so as to form latching protrusions 82. At the latching protrusions 82 may be formed bolt holes (not shown), through which bolts are inserted. A plurality of I-type metal plate studs 85 are connected to each other by means of the

stud connecting metal plate members 76. As illustrated in FIG. 23, an I-type metal plate stud 88 is formed such that the width of the I-type metal plate stud 88 is gradually increased toward the lower part thereof. The I-type metal plate stud 88 is advantageously used when an inclined retaining wall is formed or an inclined foundation wall is formed.

FIGS. 24 to 29 are perspective view respectively illustrating "["-shaped metal plate studs used for the form panel system according to the present invention. As illustrated in FIGS. 24 to 29, each "["-shaped metal plate stud 90 is composed of a metal plate having excellent corrosion resistance and strength, such as a galvanized steel plate. The openings 71 are formed at the "["-shaped metal plate stud 90. The "["-shaped metal plate stud 90 is bent at the right angle at both opposite sides thereof so as to form latching protrusions 92. The reinforcing bars are fitted in the narrow openings 71 of the "["-shaped metal plate stud 90. Two of the metal plate studs are disposed while being opposite to each other, and the stud connecting metal plate member 76 is fixed to the metal plate studs by means of screws or aluminum rivets, so as to form a double "["-shaped metal plate stud 95. Alternatively, the stud connecting metal plate member 76 may be fixed to the metal plate studs by means of welding without using the screws. A non-symmetrical "["-shaped metal plate stud 97 has a narrow upper part and a wide lower part. That is, the width of the upper part of the "["-shaped metal plate stud 97 is greater than that of the lower part of the "["-shaped metal plate stud 97. "["-shaped metal plate studs 100, 105, and 107 have further bent ends, respectively.

FIGS. 30 and 31 are views respectively illustrating examples of metal plate studs of the form panel system according to the present invention, each of the metal plate stud having openings whose widths are gradually decreased toward the lower parts thereof. As illustrated in FIGS. 30 and 31, openings 113 formed at a metal plate stud 111 are formed in the shape of inverted triangles, the widths of which are gradually decreased toward the lower parts thereof, i.e., in the direction in which the gravity is applied. Alternatively, various kinds of openings whose

widths are gradually decreased toward the lower parts thereof so as to perform a wedge coupling function due to the weights of reinforcing bars may be adopted in addition to the openings formed in the shape of inverted triangles. A non-symmetrical metal plate stud 112 has a narrow upper part and a wide lower part. That is, the width of the upper part of the metal plate stud 112 is greater than that of the lower part of the metal plate stud 112.

FIGS. 32 and 33 are perspective view respectively illustrating foamed plastic studs used for the form panel system according to the present invention. As illustrated in FIGS. 32 and 33, foamed plastic blocks are cut by means of the multiple heating wire-type forming machine so as to form openings 121 and reverse-trapezoid latching protrusions 122. In this way, I-type foamed plastic studs 120 and 125 are prepared.

FIG. 34 is a perspective view illustrating a form panel system according to a preferred embodiment of the present invention. As illustrated in FIG. 34, the latching protrusions forms at one sides of the metal plate stud 105 and the foamed plastic stud 120 are engaged in the supporting grooves of the foamed plastic panel 55 fixed to the compression cement board assembly 35 in a sliding fashion, and the latching protrusions formed at the other sides of the metal plate stud 105 and the foamed plastic stud 120 are engaged in the supporting grooves of the foamed plastic panel fixed to the compression cement board assembly in a sliding fashion. In this way, the form panel system according to the present invention is obtained. For secure fixation, the metal plate stud 105 is fixed to the compression cement board assembly 35 by means of screws 107. Also, the reinforcing bars are horizontally inserted through the openings 71 formed at the metal plate stud.

FIG. 35 is a perspective view illustrating a one-plane connecting member used to connect compression cement boards of the form panel system according to the present invention to each other on the same plane, and FIG. 36 is a plan view illustrating compression cement boards connected to each other by means of the one-plane connecting member. As illustrated in FIGS. 35 and 36, a one-plane

connecting member 140 is a bar having reverse-trapezoid latching protrusions 141 formed at both ends on one side thereof. The one-plane connecting member 140 is made of a foamed plastic material.

The latching protrusions 141 of the one-plane connecting member 140 are engaged in the reverse-trapezoid supporting grooves 57e of the foamed plastic panels 56 connected to each other on the same plane, respectively. Consequently, concrete is prevented from leaking by engagement of the latching protrusions 141 of the one-plane connecting member 140 in the reverse-trapezoid supporting grooves 57e of the foamed plastic panels.

Although the one-plane connecting members 140 are attached to the foamed plastic panels 56, which are disposed opposite to each other, concreted injected into the form panel system freely moves from the space between a pair of foamed plastic panels to space between another pair of foamed plastic panels, since the spaces are present between the one-plane connecting members 140.

FIG. 37 is a perspective view illustrating a one-plane connecting metal plate member, and FIG. 38 is a plan view illustrating compression cement boards connected to each other by means of the one-plane connecting metal plate member. As illustrated in FIG. 37, a one-plane connecting metal plate member 142 is composed of a straight metal plate having latching protrusions formed at both opposite sides thereof by bending the both opposite side ends twice. As illustrated in FIG. 38, slits 59a, in which the latching protrusions are engaged, are formed at the foamed plastic panels 58 fixed to the compression cement boards 20. Consequently, latching protrusions of the one-plane connecting metal plate member 142 are engaged in the slits 59a formed at the opposite ends of the adjacent foamed plastic panels 58. As a result, the foamed plastic panels 58 are connected to each other in the longitudinal direction thereof. Between the opposite one-plane connecting metal plate members 142 freely moves concrete, and the gap between the foamed plastic panels 58 is covered by means of the one-plane connecting metal plate member 142. Consequently, concrete is prevented

from leaking.

FIG. 39 is a plan view schematically illustrating that compression cement boards, to which foamed plastic panels are fixed, are connected to each other by means of a two-plane connecting metal plate member. As illustrated in FIG. 39, the two-plane connecting metal plate member has the same construction as the double "["-shaped metal plate stud, which is formed by attaching two "["-shaped metal plate studs to each other while being in contact.

At the ends of the foamed plastic panels 59 fixed to the respective compression cement boards 20, which is connected to each other in the longitudinal direction thereof, are formed slits 59b, in which the latching protrusions of the two-plane connecting metal plate member 105 are engaged. At each of the foamed plastic panels 59 are also formed various-shaped slits 59c, 59d, and 59e corresponding to the shapes of the latching protrusions of the metal plate studs 90, 95, and 100, in addition to the slit in which the corresponding latching protrusion of the two-plane connecting metal plate member 105 is engaged.

In the slits 59b of the foamed plastic panels 58 connected to each other in the longitudinal direction thereof on one plane are engaged the latching protrusions formed at one end of the two-plane connecting metal plate member 105, and in the slits of the foamed plastic panels connected to each other in the longitudinal direction thereof on the other plane are also engaged the latching protrusions formed at the other end of the two-plane connecting metal plate member. As a result, four foamed plastic panels are connected to each other.

The various-shaped metal plate studs 90, 95, and 100 are engaged in the slits of the foamed plastic panel. The various-shaped slits 59b, 59c, 59d, and 59e disposed at the foamed plastic panel are easily formed by means of the above-mentioned electric heating wire-type forming machine.

One or more of the various-shaped slits may be applied to the foamed plastic panel. Also, the metal plate studs and the two-plane connecting metal plate member may be fixed to the compression cement board by means of fixing

pieces.

FIG. 40 is a longitudinal sectional view illustrating a form panel system according to another preferred embodiment of the present invention. As illustrated in FIG. 40, the form panel system according to the present invention is manufactured without using the foamed plastic panels. Specifically, the latching protrusions of the one-plane connecting member 140 are engaged in the supporting grooves 24 formed at the respective compression cement boards 22 so as to connect the compression cement boards 22 to each other in the longitudinal direction of the compression cement boards 22. The opposite cement board reinforcing members 31 is connected to each other via the metal plate stud 95 disposed between the opposite cement board reinforcing members 31. The metal plate stud 95 is fixed to the respective cement board reinforcing members 31 by means of fixing pieces. Concrete is prevented from leaking from the gap between the compression cement boards 35 by means of the one-plane connecting member 140.

When only the compression cement boards are used, the manufacturing process of the form panel system is simplified although the heat insulation effect is somewhat reduced.

FIG. 41 is a longitudinal sectional view illustrating a form panel system according to another preferred embodiment of the present invention. As illustrated in FIG. 41, the various-shaped metal plate studs 90, 95, 100, and 105 are fixed to the vertical-type reinforcing members 31 attached to the opposite compression cement board assemblies 36 by means of fixing pieces 107. Consequently, the compression cement board assemblies are connected to each other while being spaced a predetermined distance from each other.

FIG. 42 is a longitudinal sectional view illustrating a form panel system according to another preferred embodiment of the present invention. As illustrated in FIG. 42, the foamed plastic panel 55 is fixed to one of the opposite compression cement boards 35 at the inside thereof, and the metal plate stud 95

and the foamed plastic stud 120 are engaged in the supporting grooves of the foamed plastic panel 55. At this time, the heat insulation effect is increased by means of the foamed plastic panel 55 fixed to the corresponding compression cement boards 35.

FIG. 43 is a partial perspective view illustrating a form panel system according to another preferred embodiment of the present invention. As illustrated in FIG. 43, the form panel system according to the present invention is a foundation wall form panel used to construct a concrete foundation structure or a foundation wall for building or civil-engineering works or a foundation wall of a retaining wall. The compression cement board assembly 35 is vertically disposed at one side of the form panel system. The latching protrusions formed at one side of a metal plate stud assembly having two metal plate studs 80 attached to each other are engaged in the supporting grooves of the compression cement board assembly in a sliding fashion, and the metal plate stud assembly is attached to the opposite compression cement board assembly at the other side thereof. To the lower ends of the metal plate studs are attached bottom connecting members 70 to fix the lower ends of the metal plate studs to the ground. In the illustrated embodiment, the foamed plastic panel is not attached to the inside of the compression cement board assembly, although the foamed plastic panel may be attached to the inside of the compression cement board assembly. Reinforced bars 131 are inserted through the openings of the metal plate studs, and right-angle bent reinforced bars 135 are vertically disposed and attached to the metal plate studs 80 to reinforce concreted to be cured.

FIG. 44 is a perspective view illustrating a form panel system according to yet another preferred embodiment of the present invention. As illustrated in FIG. 44, the form panel system according to the present invention comprises: a foundation wall; and a general wall integrated with the foundation wall. To the foundation wall form panel, which is disposed at the lower part of the form panel system, are fixed two metal plate studs 80, to which the bottom fixing members 70

are attached, between the compression cement board assemblies 35. To the general wall form panel, which is disposed at the upper part of the form panel system, is fixed one metal plate stud 80 between the compression cement board assemblies 35. The reinforcing bars 131, which are horizontal reinforcing members, are horizontally inserted through the metal plate studs 80 fixed to the foundation wall form panel and the general wall form panel, and the right-angle bent reinforcing bars 135 are attached to one sides of the metal plate studs 80 fixed to the foundation wall form panel and the general wall form panel by means of welding. The integrally formed reinforcing bars are bent at right angles, and attached to the studs by means of welding. Consequently, when concrete is injected and solidified, the general wall, which may be an inner wall or an outer wall, is more securely fixed to the foundation wall. Also, the compression cement board connecting members 39 are fixed where the compression cement board assemblies 35 are vertically connected to each other.

The construction of a form deck panel system using the compression cement board according to the present invention will be described hereinafter in more detail.

FIG. 46 is a perspective view illustrating a supporting beam used for a form deck panel system according to the present invention. In the form deck panel system using the compression cement board according to the present invention as illustrated in FIG. 46, two "["-shaped metal plate studs 90 are attached to each other while being in contact by means of the stud connecting members 76 to prepare a supporting beam 160, which serves as a girder of the bottom between the floors. The bent parts of the "["-shaped metal plate studs support the compression cement boards, which will be described below.

FIG. 47 is a perspective view illustrating a foamed plastic bottom plate panel and an upper bottom plate panel used for the from deck panel system using compression cement boards according to the present invention. As illustrated in FIG. 47, a foamed plastic bottom plate panel 170 is used to construct the bottom

between the floors. The foamed plastic bottom plate panel 170 is provided at the lower surface thereof with grooves 172 having rectangular sections, and the foamed plastic bottom plate panel 170 is provided at the upper surface thereof with reverse-trapezoid supporting grooves 174. When the bottom between the floors are constructed in a double-layer fashion, an upper bottom plate panel 180, made of a foamed plastic material, which is provided at the upper and lower surfaces thereof with reverse-trapezoid supporting grooves 182, is disposed on the foamed plastic bottom plate panel 170.

FIG. 48 is a perspective view illustrating a double-layered form deck panel using compression cement boards according to the present invention. In the double-layered form deck panel using compression cement boards according to the present invention as illustrated in FIGS. 47 and 48, the compression cement board assembly 37 is disposed between the supporting beams 160, and the foamed plastic bottom plate panel 170 is disposed on the compression cement board assembly 37. In the supporting grooves 174 formed at the upper surface of the foamed plastic bottom plate panel 170 are engaged the metal plate studs 80, on which the upper bottom plate panel 180 is disposed. The metal plate studs are also disposed on the upper bottom plate panel 180. In the double-layered form deck panel system using compression cement boards, concrete is filled on the upper bottom plate panel where the metal plate studs are disposed to form a double-layered bottom between floors.

Between the studs 80 disposed between the bottom plate panel and the upper bottom plate panel may be disposed a water supply pipe, a soil pipe, or a drainpipe 185. Consequently, the double-layered form deck panel system using compression cement boards has an advantage in that water piping and heat insulation are simultaneously accomplished.

FIG. 49 is a partial sectional view illustrating a building, to which the form panel system and the form deck panel system according to the present invention are applied. As illustrated in FIG. 49, the studs are attached to the

compression cement board or the foamed plastic heat-insulating form panel according to the present invention to form a foundation wall 190, inner and outer walls 192, bottoms between floors 194, and a roof 196.

The panel system according to the present invention is not limited to the panel for walls. For example, the panel system according to the present invention is appropriately applicable to various-shaped floors and walls, covers, roofs, decks, buildings, and various-shaped and multi-purpose concrete structures, such as fences, bridges, and water tanks.

In the embodiments of the present invention, the metal plate studs are disposed vertically, i.e., in the lateral direction of the compression cement board, although the metal plate studs may be disposed horizontally, i.e., in the longitudinal direction of the compression cement board. This construction is suitable when the height of the wall is low, such as a one-story building. In this case, a small number of relatively long reinforcing members are disposed in the longitudinal direction of the compression cement board rather than a large number of relatively short reinforcing members are vertically disposed, which is very economical. Also, this construction is very suitable when reinforcement is further required to lateral bending stress rather than longitudinal bending stress. When the metal plate studs are disposed horizontally, the reinforcing bars are inserted vertically through the openings of the metal plate studs.

The supporting grooves or slits of the foamed plastic panel, which are used in the description of the embodiments of the present invention, indicate the coupling structures where the corresponding members are engaged in the supporting grooves or slits. Consequently, it should be interpreted that the supporting grooves or slits means have the same structures. Such specific terminologies are selected for convenience, and therefore, they do not restrict the scope of the present invention.

Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that

various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

【Industrial Applicability】

The present invention is applicable to a fixed-type form panel system comprising form panels constituting a foundation wall, a bottom between floors, and a roof of a building or a concrete structure, compression cement boards using vertical reinforcement-purpose metal plate studs, and steel studs.